

## Synthesis of lithium titanate ( $\text{Li}_4\text{Ti}_5\text{O}_{12}$ ) through hydrothermal process by using lithium hydroxide (lioh) and titanium dioxide ( $\text{TiO}_2$ ) xerogel

Bambang Priyono, author

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### Abstrak

Lithium Titanate ( $\text{Li}_4\text{Ti}_5\text{O}_{12}$ ) or (LTO) has a potential as an anode material for a high performance lithium ion battery. In this work, LTO was synthesized by a hydrothermal method using Titanium Dioxide ( $\text{TiO}_2$ ) xerogel prepared by a sol-gel method and Lithium Hydroxide (LiOH). The sol-gel process was used to synthesize  $\text{TiO}_2$  xerogel from a titanium tetra-n-butoxide/ $\text{Ti}(\text{OC}_4\text{H}_9)_4$  precursor. An anatase polymorph was obtained by calcining the  $\text{TiO}_2$  xerogel at a low temperature, i.e.: 300oC and then the hydrothermal reaction was undertaken with 5M LiOH aqueous solution in a hydrothermal process at 135oC for 15 hours to form  $\text{Li}_4\text{Ti}_5\text{O}_{12}$ . The sintering process was conducted at a temperature range varying from 550oC, 650oC, and 750oC, respectively to determine the optimum characteristics of  $\text{Li}_4\text{Ti}_5\text{O}_{12}$ . The characterization was based on Scanning Thermal Analysis (STA), X-ray Powder Diffraction (XRD), Field Emission Scanning Electron Microscopy (FESEM), Fourier Transform Infrared spectroscopy (FTIR), and Brunauer-Emmett-Teller (BET) testing results. The highest intensity of XRD peaks and FTIR spectra of the LTO were found at the highest sintering temperature (750oC). As a trade-off, however, the obtained LTO/ $\text{Li}_4\text{Ti}_5\text{O}_{12}$  possesses the smallest BET surface area ( $< 0.001 \text{ m}^2/\text{g}$ ) with the highest crystallite size (56.45 nm).